

## REVIEWS.



### INSECTIVOROUS PLANTS.\*

HOW often have we not heard the question asked by officers of the Army and Navy who have been abroad, What is to be done in a place like India? what resources lie open to a man but hunting, shooting, and flirtation? And what a splendid reply is given by the author of the work on Insectivorous Plants which is now before the world. It is to an ordinary person perfectly astounding what a naturalist of Mr. Darwin's turn of mind can see in objects which have been under the eyes of all, and yet have not till now been properly observed. And the present volume is literally a perfect storehouse of observations which have been conducted by Mr. Darwin, and by certain foreigners who have been even earlier in the field than the renowned English biologist. It will, doubtless, appear strange to the person who is not well versed in modern natural history, that the present work has to do exclusively with the different modes in which certain plants capture, kill, and devour animals; yet assuredly such is the nature of the book's contents. Mr. Darwin covers more than 450 pages by his graphic accounts of the different plants he has watched, of their several modes of capturing their prey, and of the effects of different inorganic and organic substances on their power of digestibility. And of his mode of conducting his experiments, and his careful method of carrying on his observations, it is impossible to speak (as, of course, those who are familiar with Mr. Darwin's writings would have anticipated) in too impressive a manner. He has given us the history of more than twenty different plants, some of them, as *Drosera*, at immense length, and with a vast number of original observations, and others which were had with great difficulty from abroad, and which only allowed of a limited number of experiments, less abundantly experimented on, but not on that account with less accuracy of observation. In every case we note—what we have ever had to observe in writing of Mr. Darwin—that tendency to give the utmost credit to his fellow-labourers, even when the observations made by them do not in any way agree with his own.

Mr. Darwin appears to be the first who has accurately recorded those various changes which certain cells appear to undergo even in a compara-

\* "Insectivorous Plants." By Charles Darwin, M.A., F.R.S., &c. With Illustrations. London: John Murray, 1875.

tively brief space of time. His diagrammatic sketches of a cell, which show the several changes it has undergone in the course of about sixteen minutes, are full of interest, and they will at once recall to the mind of the student of human microscopic anatomy the sort of thing seen when a fresh piece of certain mucous membranes is submitted to examination. We think, in regard to those observations, that what the writer remarks is extremely probable—for, indeed, we have ourselves witnessed it when employing improved illuminators—viz. that in some of the specimens, in which apparently two distinct cells existed, there really was a connecting cord, which was “drowned” by the method of throwing the light on the object. He says, p. 41: “At first there was at the base of the cell a little mass on a short footstalk, and a larger mass near the upper end, and these seemed quite separate. Nevertheless, they may have been connected by a fine and invisible thread of protoplasm, for on two other occasions, whilst one mass was rapidly increasing and another in the same cell rapidly decreasing, I was able, by varying the light and using a high power, to detect a connecting thread of extreme tenuity, which evidently served as the channel of communication between the two.”

Of the many experiments the author has made with reference to the digestible power of certain plants, some of the most interesting are those he conducted on the *Drosera rotundifolia*. These showed that raw flesh, when placed upon the leaf, was completely digested in a comparatively short space of time. But one would have thought that bone was entirely beyond the power of the plant. It does not appear so from the following account which Mr. Darwin has given:—“Dr. Burdon Sanderson suggested to me that the failure of *Drosera* to digest the fibrous basis of bone might be due to the acid being consumed in the decomposition of the earthy salts, so that there was none left for the work of digestion. Accordingly, my son thoroughly decalcified the bone of a sheep with weak hydrochloric acid, and seven minute fragments of the fibrous bases were placed on so many leaves, four of the fragments being first damped with saliva to aid prompt inflection. All seven leaves became inflected, but only very moderately, in the course of a day. They quickly began to re-expand, five of them on the second day, and the other two on the third day. On all seven leaves the fibrous tissue was converted into perfectly transparent, viscid, more or less lignified little masses.” Thus we see that even decalcified bone was nearly completely dissolved by the plant, although evidence of absorption was not as clearly shown. Among other curious experiments conducted on the *Drosera* was one of some importance, as it shows what a difference may exist between the action of a poison on animals and plants. It was the trial of cobra poison, which, while it is most deadly in its action on animal life, does not appear to have any influence on the vitality of the plant. The author says that “from these facts it is manifest that poison of the cobra, though so deadly to animals, is not at all poisonous to *Drosera*, yet it causes strong and rapid inflection of the tentacles, and soon discharges all colour from the glands.” Indeed, he seems to think that in some way or other it acts as a stimulant to the protoplasm of the plant.

Another point which Mr. Darwin has investigated, and with strange results, is that of the direction of the inflected tentacles. And though he

has performed many experiments on the subject, and has inquired into the mode in which a stimulant is made to travel, yet we do not think he has added very much to our knowledge on the subject. His (or rather his son's) drawing, which represents a leaf of *Drosera* with its tentacles in-folded over a piece of meat, is an admirable illustration. It shows the whole process so much better than words can convey it, and to our minds it is exceedingly like a sea-anemone that had just grasped a small crustacean. Well might the author say, "We might imagine that we were looking at a lowly organised animal seizing prey with its arms," and, further on, that "the case of the *Drosera* is far more interesting [than the motion of tendrils], as here the tentacles are not directly excited, but receive an impulse from a distant point; nevertheless, they bend accurately towards this point." With regard to this very interesting process, the following attempted explanation is offered by Mr. Darwin:—"About the mechanism of the movements and the nature of the motive impulse we know very little. During the act of inflation fluid certainly travels from one part to another of the tentacles. But the hypothesis which agrees best with the observed facts is, that the motive impulse is allied in nature to the aggregating process, and that this causes the molecules of the cell-walls to approach each other in the same manner as do the molecules of the protoplasm within the cells, so that the cell-walls contract. But some objections may be urged against this view." After some further remarks the author truly says, "We see how little has been made out in comparison with what remains unexplored and unknown."

Mr. Darwin describes with the utmost minuteness his numerous experiments on some of these animal feeders, and it is perfectly astonishing to see the number of flies which a single specimen of some of the plants observed by him have captured. And the reader must not suppose that they are simply captured insects. They are regularly digested. The plant closes on them, and they are thus killed; and it is not till the whole of their soft parts have been dissolved and absorbed that they open, and thus reject the excrementitious matter. Thus it is that certain of these plants are provided with such imperfect roots; they do not require food supplied through the roots, because they are able to obtain a quantity through the multitude of insects they captivate. "There can hardly be a doubt," says the author, that these plants "have the power of dissolving animal matter by the aid of their secretion, which contains an acid, together with a ferment almost identical in nature with pepsin; and that they afterwards absorb the matter thus digested. This is certainly the case with *Drosera*, *Drosophyllum*, and *Dionaea*; almost certainly with *Aldrovanda*, and, from analogy, very probably with *Roridula* and *Byblis*. We can thus understand why it is that the three first-named genera are provided with such small roots, and that *Aldrovanda* is quite rootless; about the roots of the two other genera nothing is known. It is no doubt a surprising fact that a whole group of plants should subsist partly by digesting animal matter, and partly by decomposing carbonic acid." But Mr. Darwin instances as remarkable a fact in the Animal Kingdom by pointing to those peculiar rhizocephalous crustaceans which are absolutely destitute of an alimentary canal.

We cannot touch on any of the author's observations on the genus

*Pingicula*, which are of extreme value, but we must now conclude our very imperfect notice of this Mr. Darwin's latest labour; and while we thank him most heartily for giving us so admirable a book, we confess that he has but opened up a vast field wherein future naturalists may reap rich harvests of experiment and observation.

### TYNDALL ON LIGHT AND SOUND.\*

**T**WO new editions of these splendid though in a certain sense elementary volumes are now before us, and demand a word or two in notice of their author's efforts at improvement of his former labours. The book on "Light" is of course very much as it was in the first edition, because in the department of Physics, to which it belongs, there has not been very much done to advance the science. Still, however, it has certain features of novelty. For example, there is the Appendix, in which are to be found three brief addresses by distinguished Americans, which, though short, are nevertheless eloquent and to the point. The portion omitted from the present edition is the reply of Dr. Young to the Edinburgh "Reviewers." This was introduced into the former edition, which was really an American publication, and it has served the purpose for which it was originally published. Hence it loses its place in the work now before us, and in its stead is an admirable engraving of Dr. Young, which has been well executed by Mr. Adlard, from the painting by Sir T. Lawrence.

It is in the "Sound," which is a work nearly twice the size of the former, and which is in its third issue, that the most remarkable additions have been made. Since the second issue the author has been carrying through (for the Trinity House) a very remarkable series of experiments, and he has been led by these to the formulation of certain doctrines which he thinks are definitely conclusive. On this point Professor Tyndall has been directly at variance with the conclusions already drawn up by the Light-house Board at Washington; a circumstance which is somewhat unfortunate, even though, as it seems most probable, Professor Tyndall is clearly in the right. It is on this account, doubtless, that the author enters at such length into the discussion of the entire question. And from a perusal of the facts, as set forth by Dr. Tyndall, it would certainly appear that he is clearly correct, and the Americans inaccurate in their account. This seems so from the fact, which is particularly dwelt on by the author, viz., that "the echoes have often manifested an astonishing strength when the sea was of glassy smoothness. On days when the echoes were powerful I have seen the southern cumuli mirrored in the waveless ocean in forms almost as definite as the clouds themselves. By no possible application of the law of incidence could the echoes from such a sea return to the shore; and if we accept for a moment a statement which Professor Henry seems to endorse, that sound-waves of great intensity, when they impinge upon a solid or a liquid surface,

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\* "Six Lectures on Light, delivered in America in 1872-73." By John Tyndall, LL.D., F.R.S. Second edition. And "Sound." By John Tyndall, LL.D., F.R.S. Third edition. London: Longmans, 1875.